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III.

On the Latitude of Boston.

BY ROBERT T. PAINE, A. A. S.

In the year 1825, a highly recommended sextant, by Ramsden, having been put in my possession, I was induced to determine with it the difference between the latitude of my residence at that time and of the new State House, estimated at about twenty-seven seconds. On the first, second, third, fourth, and sixth days of November of that year, I measured with it the sun's meridian altitude, but was greatly surprised at the result; as although the observations agreed with each other exceedingly well, they made the position of the house only 42° 20′ 30″, or one hundred and eighteen seconds less than that of the State House, as laid down in the 297th page of the third volume of the Transactions of the Society. The accuracy of the position of that building not then being suspected, the difference was ascribed to some undiscovered error in the instrument.

In 1827, after many and repeated examinations of the sextant, I measured twenty-eight meridional altitudes of the Sun, which, by allowing for the difference of position of the two places of observation, gave almost exactly the same result, and of course placed the State House, Harvard Hall in Cambridge, and Salem about ninety seconds nearer the equator than had been supposed. My absence from the United States in the winter of 1827–28 interrupted my observations, which were resumed in the autumn of the latter year, with another instrument by the same maker. With this, 194 altitudes were measured in October, November, and December, 1828, and in January, 1829. Although this instrument was small, the result shows, that it is equally to be depended on with the larger. The altitudes were measured within a few minutes of noon, and reduced to the meridian, by the rules of spherical trigonometry. In January, 1829, I again had recourse to the sextant first used, and, in the course of that month, of February, March, and April, measured with it 369 altitudes more; having continued my observations until the double altitude of the Sun became too great to be ascertained with an instrument of reflection.

Within a very short time I have also obtained a few altitudes with a new sextant by Parkinson and Frodsham, and with a repeating circle made by Troughton for the United States, which have verified the results given by the two sextants by Ramsden.

The surprising agreement between the results of these two instruments is rendered the more satisfactory from the circumstance, that the smaller was used when the Sun was near the winter solstice, and the double altitude between 48° and 68°, and the larger, when the Sun was in general much nearer the elevated pole, and the double altitude between 56° and 124°.

On reference to the manuscript containing my observations, which I have the honor herewith to present to the Society, it will be observed, that the Refraction, the Reduction to noon, and the Declination of the Sun, were calculated for, and the latitude deduced from each altitude; that the last 350 observations did not produce any change in the result, and that the mean of the first 50 differs only two thirds of a second from the mean of all.

The difference between the latitude of the State House and of my residence was determined by the latest and most accurate map of the city, but may be in a very slight degree erroneous, a point which will soon be ascertained by a trigonometrical admeasurement.

Latitude of the new State House in the city of Boston as determined by nearly six hundred observations, made in the house at the southeasterly corner of Essex and Short streets, supposed to be 2310 feet South 29° 41′ East, of the State House.

Instruments.

Ramsden's Sextant No. 1375, of nine inches' radius.
" " " 1403, of six inches' radius.

Mean of 194	Observations by No. 1403, in October, November, and December, 1828, and in January, 1829. (Greatest lat. 42° 20′ 60″·4. Least 42° 20′ 14″·6)	42° 20′ 37″·97
Mean of 390	Observations by No. 1375, in March, April, September, October, and November, 1827, and in January, February, March, and April, 1829, (Greatest lat. 42° 20′ 59″·7. Least 42° 20′ 16″·1)	38·08
Mean of 584	Observations by both instruments	38·04
	Reduction to the State House	19·8
Latitude of the State House		42° 20′ 57″·8